



Small Spacecraft Avionics

Craig Pires
Systems Analyst



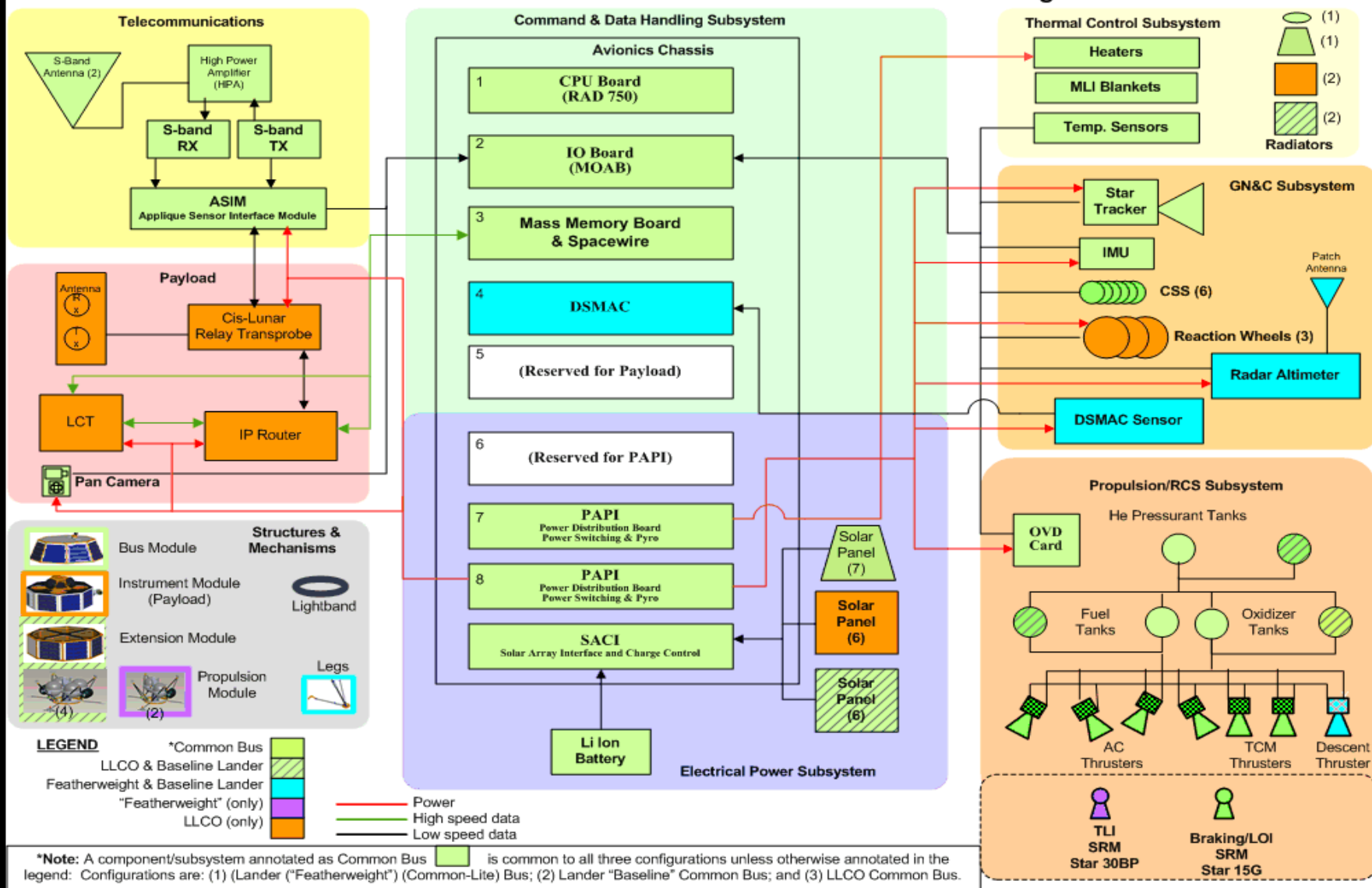
Small Spacecraft Projects

- NanoSat/CubeSat
 - GeneSat
 - PharmSat
- LCRRS - Low Cost Rapid Response System
 - CheapSat
 - Use of Commercial Electronics and S/W within Pressure Vessel
- Small Sat
 - Common Bus – <150 kg, ~150 Watts, 40 kg payload
 - Missions – XNAV, Lunar Laser Comm
 - 2 years, \$50 - \$100M



Common Bus Architecture

Small Satellite — Common Bus Architecture Functional Block Diagram





Common Bus Overview

Put together infrastructure for developing small spacecraft software using Model Based Development

2007 Objectives:

- Develop approach/processes
 - Rapid I&T using Auto-code generation
 - SWIL, PIL and HWIL Testing
- Conduct tool trades
- FlatSat - Small cart on flat granite table
- Demonstrate 6DOF control on Free Flyer with cold gas thrusters
- Cruise Phase Simulation
 - Demonstrate “lost-in-space” algorithm
 - Trajectory correction maneuvers in simulation



Overall Design Goals

- Rapid Development and Deployment
- Flexible Infrastructure
- Class D Mission
- Single String acceptable
- Flight Heritage not mandatory
- Leverage Existing Designs



Areas of Interest



Areas of Interest

- CPU/GN&C Units
 - Low Cost Development Units
 - Low Cost Flight Units - RadHard
 - Smaller and more integrated
- Solar Panels
 - High Efficiency
 - Low Cost
- Power Management/Fault Protection



Areas of Interest

- Radios Low Power/Low Cost
- IMU - Increase in sensitivity, accuracy
- Low Cost, Space Rated GPS
- Other Avionics
 - Star Trackers
 - Magnetometers
 - Sensors
 - Storage



Areas of Interest

- Simulation Tools
 - Hardware - HWIL
 - PIL - Realistic Flight Environment
- Lower Cost Development H/W
- Development Tools
 - Integration of Linux and Windows S/W into Flight Environment
 - Model Based Development



Questions?